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# Questioning Learning

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**This paper draws on observation data from 54 teaching episodes in Year 2 and Year 6 whole-class teaching. It describes the findings of the analysis and illustrates how 'interactive', whole-class teaching is characterised by questions requiring predetermined answers. Speculative questions, which invite opinions, hypotheses and imaginings, or process questions, which invite children to articulate their understanding occupy little of the classroom talk arena. Despite national initiatives to develop greater use of whole-class teaching with higher levels of interactivity, teachers use questioning to maintain control and to support their teaching, rather than pupil learning. The paper raises important issues about the nature of interactivity in whole-class teaching and about the role questions play in supporting and extending pupils' learning experiences.**

**Keywords:** teacher questioning, interactive teaching, higher order thinking

## Introduction

The primacy of talk in the classroom context has long been recognised as central to learning, spanning the centuries, from classical notions of Socratic dialogue, through to Victorian schoolrooms typified by pupil recitation and didactic teacher instruction, to more recent times which have witnessed the evolution of different perspectives on classroom talk. Theoretical conceptual frameworks which articulate the role of talk in supporting learning have often emphasised differing facets of talk in the classroom, such as the need to acknowledge the influence of the home or street language (Bernstein, 1971; Tough, 1977; Wells, 1986), the value of group talk in generating constructive contexts for learning (Alexander, 2002; Barnes *et al*., 1986), or psychological explorations of the interrelationship between talk and thought (Vygotsky, 1986). Common to much of this research of the late 20th century is an examination of the power relationships constructed and maintained in the classroom through the medium of talk, and the way in which these relationships impact upon learning.

Central to many of these descriptions of the pattern of classroom discourse is a fundamental asymmetry of power (Anderson & Hilton, 1997; Edwards & Westgate, 1994; Summers, 1991) and potentially '*conflicting agendas of teachers and pupils*' (Summers 1991). Within this environment, what is learned and what is valued is controlled and confined by the teacher, whose educational role Edwards and Mercer (1987) describe as the '*induction of children into the academic world of knowledge and discourse inhabited by the teacher*'; in other words, '*cognitive socialisation through discourse*'. The pattern of classroom discourse thus described is essentially transmissive, where the teacher endeavours to pass on to pupils the

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body of knowledge which he or she possesses, but is as yet unpossessed by pupils. Although the terms 'discussion' or 'interaction' are frequently used to describe the oral exchanges between pupils and teachers, these interactions are commonly devoid of the discourse characteristics one would normally associate with discussion. Most apparent is the linguistic dominance (Barnes *et al.*, 1986; Hodge, 1981) of the teacher who controls and manipulates the classroom discourse to achieve his or her purposes. This is not simply in the managerial role of organising, turntaking and maintaining order but also in the qualitative role of determining which contributions are to be valued (Edwards & Westgate, 1994).

Overlaying this dominance is the way teachers use questions in the classroom – unlike most contexts found outside the classroom (with the exception perhaps of a law court), the teacher asks questions to which he or she already knows the answers. And pupils who are quick to develop implicit recognition of the rules of classroom discourse learn that usually only one answer or a limited range of answers is acceptable. One consequence of this is that episodes supposedly planned to encourage talk between teacher and pupil results in pupils uttering only '*elliptical sentence fragments*' (Wells, 1986) as they play a guessing game of what is in the teacher's head. The process of questioning acts to align children's thinking with the teachers: it is less a process of educational enquiry, more a process of '*following the teacher's script*' (Francis, 2002). Describing teachers' questioning techniques while sharing a story with primary children, Kirby (1996) argues that it is questioning which constructs the adult–child relationship and teaches children that their own knowledge is '*subordinate to the text and the teacher*'.

Barnes' (1986) analysis of teachers' questions famously drew attention to the disproportionate number of 'closed' questions, those requiring a predetermined answer, which were asked by teachers. By contrast, 'open' questions inviting exploratory, tentative responses were rare. The implication drawn from Barnes' work is that teachers use questions to narrow and limit thinking to factual recall, rather than using questions to develop learning and understanding. The reliance upon factual or closed questions appears to be an endemic feature of teachers' talk repertoire, recorded in several older studies prior to Barnes' work (such as Gall, 1970). More recently, Alexander's (1992) study reaffirmed this: the study found that although questions were a significant feature in teachers' pedagogical armoury, teachers rarely exploited '*the full potential of questioning as a teaching strategy*'. Instead, questions were often closed, as Barnes had suggested, conversational, or lacking intellectual challenge. The ORACLE project, initially conducted in 1976 and replicated in 1996 also reported the dominance of factual and closed questions in both studies. They conclude that, despite curriculum changes, the underlying pattern of discourse remains one where '*teachers talk and pupils sit and listen' (*Galton *et al.*, 1999*)*, and that the nature of response demanded by most questions merely serves to reify this pattern of knowledge control by teachers. Summarising the findings of Wood and Wood (1988), Watts *et al.* (1997) maintain that '*teacher control of questioning constantly encourages student passivity*'.

The relationship between the type of question and the type of response is significant. Wood (1988) found that the heavy use of very specific, closed questions tended '*to generate relatively silent children and to inhibit any discussion between*

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*them*'. Similarly, Wragg (2001) found that 'naming' questions, which required a single answer, were the least probing type of question. The predominance of factual questions in questioning sequences inevitably limits the opportunity for asking higher order or multi-propositional questions and thus it is not surprising that '*questions which required the children to extend their thinking or which sought to clarify the text meaning'* are *' rare.'* (Kirby, 1996).

Moreover, pupils rarely ask questions themselves, particularly questions which might help them to clarify or elaborate upon their understanding of a given concept. Studies have repeatedly highlighted the paucity of questions asked by pupils (Dillon, 1988; Galton *et al.*, 1999; Wragg & Brown, 2001). Dillon argued that the pattern of classroom discourse, framed by the Initiation-Feedback-Response sequence, rarely gave pupils an opportunity '*to fit a question into the ongoing cycle'* (Dillon, 1988). Alexander's Leeds study found, as Dillon had, that pupils had few opportunities to ask questions, and if they did so, these were often '*blocked or marginalised'* (Alexander, 1992). Teachers' tendency to control classroom interaction so that it operates within their own '*frame of reference'* (Mroz *et al.*, 2000) has the consequence of limiting pupils' enquiries '*resulting in a very low level of pupil questions'* (Mroz *et al.*, 2002: 382).

Within the educational context of the UK, these research findings are counterpointed by policy initiatives in both the primary and secondary phases which have, in principle at least, altered accepted teaching methods and interaction patterns. The National Literacy Strategy (NLS) (DfEE, 1998) and the National Numeracy Strategy (NMS) (DfEE, 1999) for the primary sector and their secondary counterpart, the Framework for Key Stage 3, advocate more whole-class teaching than had been the norm. At the heart of this recommendation is the principle of quality interaction: the primary Literacy Strategy asserts that successful teaching is '*characterised by high quality oral work*' and that it is interactive where '*pupils' contributions are encouraged, expected and extended*' (DfEE, 1998). More recently, significant research by Black and Wiliam (1998) and by Alexander (2004) have attempted to describe more precisely the nature of high quality oral work. Black and Wiliam have highlighted the importance of opportunities for talk and the importance of effective teacher questioning in supporting formative assessment and particularly in supporting better pupil understanding of their own learning. Likewise, Alexander (2004) argues for a rejection of the typical question-answer-tell routines which characterise so many teacher–pupil interactions. His advocacy of dialogic teaching, with its emphasis on reciprocal, supportive and cumulative classroom interactions, redirects pedagogical thinking away from teacher-question-pupil answer patterns of discourse to a more shared and purposeful co-construction of knowledge and understanding. In the light of both the historical research findings about teacher questioning, and these more recent developments, this paper reports on a study which has investigated, as part of its research brief, the nature of teachers' questions in interactive, whole-class teaching.

## The Study

The research study described here, funded by the Economic and Social Research Council, set out to explore the way in which teacher–pupil interactions

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permit the development of '*principled understanding*' (Edwards & Mercer, 1987). The interface between 'interactive' and 'transmissive' is a fine one: it is all too easy to plan interactive episodes which become transmissive in delivery. Through analysing episodes of whole-class teaching, through teacher reflection, and through interviews with pupils, the study investigated how teachers, through their oral interactions, take account of and build on pupils' prior knowledge and experiences to help develop understanding of concepts being taught.

The sample comprised two cohorts, drawn from Year 2 (aged 6 to 7) in three first schools and Year 6 (aged 10 to 11) in three middle/primary schools. The schools involved in the research all belonged to one schools' academic pyramid in the south of England. Eighteen whole-class teaching episodes of approximately a quarter of an hour were videorecorded, capturing teaching in the NLS, the NMS, and a third curriculum area. Thus, a total of 54 teaching episodes were recorded. The episodes were recorded in sequences of three to allow comparisons and analysis of how the teacher built and developed understanding (mirroring Edwards and Mercer's (1987) methodology) across three consecutive teaching inputs. In practice, with literacy and numeracy, this was usually three consecutive days, whereas in other curriculum areas the three episodes sometimes spanned a week. Each teacher involved in the study completed a *post hoc* reflection upon his or her use of talk, using the video and a series of prompts as stimulated recall.

One sub-strand of the research was to explore the way questions are used to develop learning. Barnes' distinction between open and closed questions is widely used, but there are pitfalls in such a polarised distinction. Firstly, live classroom questions are not always easy to classify so broadly: Barnes himself counts a question about the features of a limerick as an open question when clearly there are only a limited number of possible acceptable answers. Secondly, and more importantly, they take no account of context and purpose. Why a teacher is choosing to use a closed or an open question is a fundamental consideration. Closed questions may be judiciously used to recap or consolidate information already covered; to establish a foundation upon which to ask more tentative, exploratory open questions; to establish what pupils already know and so on. Using the video data and a grounded theory approach, the project analysed the type and purpose of teachers' questions and how questions were used to move pupils from what they already know to new understandings.

## The Process of Deriving Categories from the Data

The video records of each teaching sequence of three were analysed using a grounded theory approach whereby the final coding categories were derived from an iterative analysis of the data. As the videos were watched, codes were determined that described both the form and the function of teachers' talk. Initially, there was no predetermined attempt to define each utterance as having a form and a function: this emerged in the process of analysis as it became evident that an utterance with a particular form could be used within a discourse sequence to serve different functions. Clarity about the forms and functions grew as the researchers refined, confirmed and cross-validated the codes being used and how each code described the data. The five researchers began by coding

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independently, the codes were refined and cross-validated throughout the process, and then formally cross-validated when the first phase of analysis was completed. Following this formal cross-validation, it was agreed that each utterance would be coded both for form and for function and a phase of refining codes in line with the validated codes began.

The utterances were divided into two groups: statements and questions. While most utterances could easily be seen to fit into one of these categories, it was clear that not all questions were inviting a response from the children: sometimes the teacher answered her own question, sometimes the teacher merely posed a question with no clear expectation of a response, so while it had the form of a question, it had the function of a statement. Conversely, some statements did require the children to respond. Questions and statements were therefore defined, not in terms of their grammatical form, but in terms of the nature of response given. So statements were defined as those utterances which invited no spoken response from the pupils, and questions were defined as those utterances which invited the pupils to make a spoken response. The final categories for the *form* of questions are outlined in Table 1.

As has already been noted, the process of analysing and coding the data made it apparent that simply categorising questions according to their form was not fully capturing many of the subtle ways in which questions were used in whole-class teaching. So, for example, the three factual questions cited in Table 1 (*What is five plus five? Why do plants have flowers? What else could I use to measure with?)* were all directed towards predetermined answers in the contexts from which they were drawn. However, they did not all function in the same way. The numeracy question was straightforward factual elicitation, and the receipt of a

**Table 1** The categorisation of the form of questions

| *Form* | *Definition* | *Example* |
|---|---|---|
| Factual | Questions which invited a predetermined answer | What is five plus five?<br>Why do plants have flowers?<br>What else could I use to measure with? |
| Speculative | Questions which invited a response with no predetermined answer, often opinions, hypotheses, imaginings, ideas | Anyone got any ideas what that could mean?<br>Do you think zoos are a good idea?<br>Anyone got any opinions about those three children?<br>If I made the slope higher, what do you think might happen then? |
| Process | Questions which invited children to articulate their understanding of learning processes/explain their thinking | How did you work that out?<br>How do you know that?<br>Can you explain why? |
| Procedural | Questions which related to the organisation and management of the lesson | Can you all see? |

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**Table 2** The categorisation of the function of questions

| *Function* | *Definition* |
|---|---|
| Class management | Related to management of behaviour/tasks |
| Factual elicitation | Asking for recall of fact/information |
| Cued elicitation | Giving clues to answer |
| Building on content | Gathering information about the topic/theme |
| Building on thinking | Making children think about the ideas and concepts; this moves ideas forward, unlike checking understanding which looks back at ideas already covered |
| Recapping | Recalling past lessons and work done in this lesson |
| Practising skills | Inviting children to rehearse, repeat or practise a strategy or grasp of understanding |
| Checking prior knowledge | Checking child's knowledge and experience which might be relevant to lesson |
| Developing vocabulary | Testing or clarifying understanding of words |
| Checking understanding | Querying understanding and checking grasp of learning undertaken |
| Developing reflection | Inviting children to think about how they are learning and the strategies they are using |

correct answer would not necessarily illumine whether the child had understood the mathematical processes. The question about why plants have flowers was from a science lesson looking at seeds and was leading explicitly towards the answer that plants have flowers so that they can produce seeds for the next generation of plants. However, the question was building on pupils' thinking about seeds and attempting to move children's thinking forward. Finally, the question about measurement tools was directed towards a limited set of possible answers but the framing of the question was inviting children to think about and reflect upon the strategies they were using to measure effectively. This aspect of the data analysis was important in providing a more three-dimensional picture of whole-class interaction.

The final categories for the *function* of questions are outlined in Table 2.

## The Findings

This paper focuses upon the way teachers use questions in whole-class talk. However, it is worth noting at this point that the number of statements used exceeded the number of questions used at a ratio of approximately 2 : 1. In the complete data set, there were 2852 statements compared with 1919 questions. This pattern of teachers using more statements than questions was repeated in both the Year 2 and Year 6 data sets. There were more significant differences in the ratio of statements to questions in literacy and numeracy. In numeracy, the ratio was more evenly balanced (658 statements to 626 questions), but in literacy there were almost twice as many statements as questions (1358 statements to 795 questions). English *et al.* (2002) claim that '*interactivity depends on the ratio of questions to statements'*; in other words, the pattern of statements relative to questions provides an indicator of whether the discourse pattern is dominantly telling or

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**Table 3** The categorisation of questions across the whole data set

| *Questions* | *Class management* | *Factual elicitation* | *Cued elicitation* | *Building on content* | *Building on thinking* | *Recapping* | *Practising skills* | *CheckingPriorknowledge* | *Developing vocabulary* | *Checking understanding* | *Developing reflection* | *Total* | *Percentage* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Procedural*** | 102 | 17 | 5 | 4 | 5 | 6 | 0 | 0 | 0 | 8 | 0 | 147 | 8% |
| ***Factual*** | 20 | 411 | 123 | 121 | 142 | 128 | 157 | 20 | 33 | 74 | 7 | 1236 | 64% |
| ***Speculative*** | 0 | 21 | 4 | 54 | 154 | 5 | 14 | 26 | 9 | 17 | 3 | 307 | 16% |
| ***Process*** | 0 | 45 | 0 | 19 | 33 | 12 | 1 | 1 | 0 | 29 | 89 | 229 | 12% |
| ***Total*** | 122 | 494 | 132 | 198 | 334 | 151 | 172 | 47 | 42 | 128 | 99 | 1919 | 100% |
| ***Percentage*** | 6% | 26% | 7% | 10% | 17% | 8% | 9% | 3% | 2% | 7% | 5% | 100% | |

asking. The data presented here suggest that telling, a transmissive model, is a stronger feature of classroom discourse, particularly literacy, than asking or answering, an interactive model.

However, a conceptualisation of interactivity as being based on the relative predominance of questions to statements is a rather crude one. Although questions invite a response and are thus notionally interactive, the nature of questions and how questions are used is of far more significance in attempting to describe the quality of classroom interactions and their relationship to pupil learning. Table 3 presents the analysis of the questions by both form and function.

The analysis indicates that by far the most common form of question is the factual question and the most common function of questions is factual elicitation. Only a minority of questions relate to higher-order thinking, such as speculative and process questions. However, a significant percentage of questions did build on thinking and did develop reflection on learning: taken together these two functions almost equal those questions that call for factual elicitation.

The pattern of results for Year 2 and Year 6 is broadly similar to that for the whole data set (see Table 4), and in most categories the Year 2 patterns are very similar to the Year 6 patterns. Nonetheless, the data do suggest that there is a cognitive difference in the nature of questioning in Year 6. Year 6 teachers ask almost twice as many process questions as Year 2 teachers, and they ask more questions which build on thinking or which require children to reflect on their learning. By contrast, Year 2 teachers are more likely to ask questions that build on prior knowledge: in fact, Year 6 teachers rarely ask such questions. There is no logical explanation as to why Year 6 teachers should be apparently so reluctant to build on children's prior knowledge, since this should be equally important at any stage of learning. It is possible that, by Year 6, curriculum priorities and impending high-accountability Key Stage 2 tests cause teachers to focus more on what they want children to know, than upon what they already know.

Analysis of the questions according to curriculum area reveals some broad similarities across subject areas, but also some significant differences (see Table 5). Indeed, there are stronger patterns of variation between the three curriculum

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**Table 4** The categorisation of questions in year 2 and year 6

| *Questions* | *Class management* | *Factual elicitation* | *Cued elicitation* | *Building on content* | *Building on thinking* | *Recapping* | *Practising skills* | *Checking Prior knowledge* | *Developing vocabulary* | *Checking understanding* | *Developing reflection* | *Total* | *Percentage* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Procedural*** | | | | | | | | | | | | | |
| Year 2 | 76 | 8 | 5 | 2 | 4 | 3 | 0 | 0 | 0 | 1 | 0 | 99 | 8% |
| Year 6 | 26 | 9 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 7 | 0 | 48 | 7% |
| ***Factual*** | | | | | | | | | | | | | |
| Year 2 | 12 | 267 | 85 | 64 | 93 | 93 | 92 | 18 | 16 | 39 | 3 | 782 | 66% |
| Year 6 | 8 | 144 | 38 | 57 | 49 | 35 | 65 | 2 | 17 | 35 | 4 | 454 | 62% |
| ***Speculative*** | | | | | | | | | | | | | |
| Year 2 | 0 | 21 | 4 | 37 | 73 | 3 | 11 | 26 | 9 | 17 | 3 | 204 | 17% |
| Year 6 | 0 | 0 | 0 | 17 | 81 | 2 | 3 | 0 | 0 | 0 | 0 | 103 | 14% |
| ***Process*** | | | | | | | | | | | | | |
| Year 2 | 0 | 15 | 0 | 10 | 12 | 7 | 1 | 1 | 0 | 11 | 45 | 102 | 9% |
| Year 6 | 0 | 30 | 0 | 9 | 21 | 5 | 0 | 0 | 0 | 18 | 44 | 127 | 17% |
| ***Total*** | | | | | | | | | | | | | |
| Year 2 | 88 | 311 | 94 | 113 | 182 | 106 | 104 | 45 | 25 | 68 | 51 | 1187 | 100% |
| Year 6 | 34 | 183 | 38 | 85 | 152 | 45 | 68 | 2 | 17 | 60 | 48 | 732 | 100% |
| ***Percentage*** | | | | | | | | | | | | | |
| Year 2 | 7% | 26% | 8% | 10% | 15% | 9% | 9% | 4% | 2% | 6% | 4% | 100% | |
| Year 6 | 5% | 25% | 5% | 12% | 21% | 6% | 9% | 0 | 2% | 8% | 7% | 100% | |

areas than there are between the two year groups. The dominance of the use of factual questions is constant across all three subject groupings, and the use of procedural questions, related to managing the classroom is also very similar.

However, there is a marked difference in the pattern of speculative and process questioning in numeracy, when compared with literacy and other curriculum areas. There are significantly fewer speculative questions in numeracy, and significantly more process questions: the pattern is an almost complete reversal of that found in literacy and other curriculum subjects. Literacy and 'other' subjects use many more speculative questions than process questions, in the case of literacy the ratio is more than 4 : 1 in favour of speculative questions, while for 'other' subjects it is more than 2 : 1. In numeracy, this pattern is reversed and the ratio is 4 : 1 in favour of process questions. This pattern is reflected in the function of questions being used, so that while fewer questions in numeracy build on thinking (12%) than is the case in literacy (23%), numeracy stands out as the one subject in which questions develop reflection on learning. After factual elicitation, the most common function of questions in numeracy is to practise skills; in fact, almost all the examples of practising skills were from numeracy lessons. There are no examples in numeracy of teachers using questions to check for prior knowledge. So a pattern emerges in numeracy of questions

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**Table 5** The categorisation of questions by curriculum area

| ***Questions*** | *Class management* | *Factual elicitation* | *Cued elicitation* | *Building on content* | *Building on thinking* | *Recapping* | *Practising skills* | *Checking Prior knowledge* | *Developing vocabulary* | *Checking understanding* | *Developing reflection* | ***Total*** | ***Percentage*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Procedural*** | | | | | | | | | | | | | |
| Literacy | 65 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 9% |
| Numeracy | 23 | 8 | 4 | 2 | 3 | 4 | 0 | 0 | 0 | 6 | 0 | 50 | 8% |
| Other | 14 | 6 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 27 | 5% |
| ***Factual*** | | | | | | | | | | | | | |
| Literacy | 12 | 151 | 50 | 74 | 84 | 41 | 32 | 8 | 14 | 52 | 2 | 520 | 65% |
| Numeracy | 6 | 136 | 34 | 10 | 30 | 30 | 122 | 0 | 12 | 9 | 5 | 394 | 63% |
| Other | 2 | 124 | 39 | 37 | 28 | 57 | 3 | 12 | 7 | 13 | 0 | 322 | 65% |
| ***Speculative*** | | | | | | | | | | | | | |
| Literacy | 0 | 15 | 1 | 18 | 87 | 0 | 4 | 21 | 6 | 14 | 3 | 169 | 21% |
| Numeracy | 0 | 0 | 0 | 6 | 26 | 2 | 2 | 0 | 0 | 0 | 0 | 36 | 6% |
| Other | 0 | 6 | 3 | 30 | 41 | 3 | 8 | 5 | 3 | 3 | 0 | 102 | 21% |
| ***Process*** | | | | | | | | | | | | | |
| Literacy | 0 | 2 | 0 | 2 | 9 | 0 | 0 | 0 | 0 | 7 | 16 | 36 | 5% |
| Numeracy | 0 | 26 | 0 | 6 | 18 | 4 | 1 | 0 | 0 | 19 | 72 | 146 | 23% |
| Other | 0 | 17 | 0 | 11 | 6 | 8 | 0 | 1 | 0 | 3 | 1 | 47 | 9% |
| ***Total*** | | | | | | | | | | | | | |
| Literacy | 77 | 171 | 51 | 94 | 182 | 41 | 36 | 29 | 20 | 73 | 21 | 795 | 100% |
| Numeracy | 29 | 170 | 38 | 24 | 77 | 40 | 125 | 0 | 12 | 34 | 77 | 626 | 100% |
| Other | 16 | 153 | 43 | 80 | 75 | 70 | 11 | 18 | 10 | 21 | 1 | 498 | 100% |
| ***Percentage*** | | | | | | | | | | | | | |
| Literacy | 10% | 22% | 6% | 12% | 23% | 5% | 4% | 4% | 2% | 9% | 3% | 100% | |
| Numeracy | 5% | 27% | 6% | 4% | 12% | 6% | 20% | 0 | 2% | 6% | 12% | 100% | |
| Other | 3% | 31% | 9% | 16% | 15% | 14% | 2% | 4% | 2% | 4% | 0 | 100% | |

which are less likely to build on thinking than is true for the other two subjects, but considerably more likely to develop reflection on learning.

Questions that build on thinking are more common in literacy than in the other two subjects, but there are fewer process questions. Teachers are more likely to ask questions that check for understanding in literacy than in the other subjects.

The raw frequencies suggest that teachers may talk more in literacy than in the other two subjects – there is a higher proportion of questions (and statements) in the 15-minute literacy episodes than in either numeracy or other curriculum subjects. This implies a pattern of short responses from children. At the time of the final data analysis for this study, English *et al.* (2002) reported their research which found that in literacy the average length of a pupil utterance was only three words. In order to compare this finding with our own data, we revisited a sub-sample of our data and counted the length of pupil utterances, which had not been in our original research design. Our own data confirmed English *et al.*'s

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finding of limited responses by children, as in our sample the average length of utterance was only four words.

## Discussion

If '*the aim of pedagogical questions, as Socrates demonstrated, is to motivate, sustain and direct the thought-processes of the pupil'* (Wood, 1988), then there is relatively little evidence in this study to suggest that whole-class interactive teaching is achieving this. The dominant forms of statements were informing and instructing, and the dominant form of questions was factual. This suggests a pattern of teaching which is transmissive, with the teachers in this study imparting factual information, and asking factual questions. The teachers appear to be the givers of information, the children the receivers. Transcripts of these videoed lessons reveal that the dominant interaction pattern is teacher-child-teacher-child, and only rarely is this pattern disrupted with teacher-child-child-child-teacher interaction patterns, for example. The child's answer serves to end an interaction pattern, and rarely to extend or initiate it. Thus, 'interactive' whole-class teaching is heavily orchestrated by the teacher both in terms of opportunities for pupils to contribute, and in terms of the nature of responses sought. Black and Wiliam (1998) identify this pattern of questioning as wholly counter-productive to the enterprise of learning:

> So the teacher, by lowering the level of questions and by accepting answers from a few, can keep the lesson going but is actually out of touch with the understanding of most of the class – the question-answer dialogue becomes a ritual, one in which all connive and thoughtful involvement suffers. (Black & Wiliam, 1998: 8)

One feature the analysis highlights is the relatively low number of questions related to higher-order thinking, those questions which '*promote reflection, analysis, self-examination and enquiry'* (Wood, 1988). Speculative questions, which invite opinions, hypotheses and imaginings, or process questions, which invite children to articulate their understanding, occupy little of the classroom talk arena. This may be due to the prioritising of teaching (delivery and content) over learning (understanding). There was some suggestion in the data that teachers were aware that speculative or process questions potentially invite a higher level of cognitive response, but they were not always confident in framing such questions, or in genuinely allowing a speculative response. Thus, there were examples of teachers' questions which appeared speculative to the children but where in fact the teacher had a set answer in mind. In one lesson, the teacher asked the class, '*What is spring?*' and was rewarded by a series of answers about flowers blooming, leaves falling, temperature changes and so on. However, the question was in fact a factual question and when none of the children's answers matched the intended response, the teacher closed the sequence with, '*Well, spring is a season'*. Elsewhere, in a literacy lesson intended to explore children's reactions and responses to a poem, the teacher strongly cued pupil response in the form of a pseudo-speculative question, *'Is the poem just describing what it is like to go barefoot on the beach?'* It is also significant that an increase in speculative and process questions would give more 'air time' to the learners as they tend to require

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longer, more sustained responses, whereas the pattern presented here by the data is very much of teacher-dominated talk with short bursts of pupil response. It is also worth considering whether the context of whole-class teaching is best suited to the encouragement of genuinely open and higher-order questions: the teacher needs to balance the need to manage the classroom behaviour and oral responses of up to 30 children with the desire to encourage responses which by definition may be slow, tentative, exploratory and not in line with the thinking of others in the class.

The different patterns of interaction between numeracy and other curriculum areas suggests there may be a subject-specific discourse for mathematical understanding, reflecting the subject's concern with processes and functions, rather than information and ideas. However, it may also reflect a recognition on teachers' part that understanding how to tackle a mathematical problem is more important than arriving at the correct answer, and that the pedagogical discourse has to enable this kind of thinking. There is a direct relationship between this discourse pattern and the recommendations of the National Numeracy Strategy. A key part of the training for teachers in introducing the numeracy strategy was the encouragement to create opportunities for children to practise skills, and to invite children to '*explain their methods and reasoning clearly*' (DfEE, 1999). Indeed, the most recent review of the numeracy strategy reiterates the importance of '*effective questioning to encourage pupils to explain their calculations*' (OFSTED, 2002).

Given the emphasis in the National Literacy Strategy upon explicit metalinguistic understanding, it seems curious that there is relatively little emphasis upon process questions and reflection upon learning in literacy. Although the NLS clearly advocates whole-class teaching in which '*pupils' contributions are encouraged, expected and extended*' (DfEE, 1998), the study described here may indicate that teachers have embraced the pedagogic practices espoused by the NLS, such as teacher modelling, and shared reading and writing, without a corollary confidence in managing children's talk effectively. The NLS emphasis upon '*well-paced*' teaching, with a '*sense of urgency*' (DfEE, 1998) may also be encouraging factual, closed questioning, because as Black and Wiliam (1998) point out, '*the only questions that can produce answers in such a short time are questions of fact*' and therefore, pace and factual questioning become synonymous. Thus, activities such as modelling, shared writing and an emphasis upon pace may unintentionally be increasing teacher talk in whole-class teaching at the expense of pupil contributions. The significant difference in the amount of teacher talk occurring between literacy and other curriculum areas investigated in this study reflects a teaching pattern which makes high demands of children as listeners. The high number of statements recorded which served a class management function in literacy (see Table 5) may be due, in part, to the need to deal with disruptions and inattentiveness precipitated by the listening demands.

This study, then, in which whole-class teaching is characterised by a high percentage of factual questions could give a depressing picture of a content-based curriculum reflecting a transmissive view of education. However, there was some evidence that teachers were trying to engage the children and scaffold their learning in a meaningful way. The coding of questions in terms of function as well as form points to more subtle interplay in teachers' use of questions.

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There were a significant number of factual questions which built on thinking, built on content, checked prior knowledge, and developed reflection on learning: taken together, these exceeded the proportion of questions that called for factual elicitation. Moreover, there was some evidence that within the whole-class episode teachers were structuring their talk in a series of discourse 'moves' to scaffold the children's learning. At the start of the whole-class teaching episode there would frequently be a short burst of closed factual questions recalling previous work, followed by questions checking children's understanding in which the teacher appeared to be establishing a base from which to develop learning. Other teachers began a whole-class teaching episode with a focused, but open question and then used the children's answers to move the thinking forward. In some cases, the teacher decided it would be simpler to tell the children a particular piece of information directly at the outset rather than playing a guessing game where through a series of closed questions the children had to ascertain what the lesson was about. These discourse moves seemed more overt and more confidently handled at the initiation of a teaching episode: as the episode of whole-class teaching progressed, the discourse moves were less evident.

Thus, this study confirms the findings of other recent studies in similar contexts, particularly in terms of how whole-class discourse is dominated by '*teacher presentation and teacher-directed question and answer'* (Mroz *et al*., 2000). But the study also reveals that within this heavily teacher-framed discourse, the function of many factual questions does frequently attempt to elicit thinking: it is as though teachers want to open up pupils' thinking and reflection but cannot relinquish the control of discourse afforded by factual questions. The pattern of teacher dominance of whole-class discourse predates the national strategies for literacy and numeracy, but there is some evidence here that the numeracy strategy has directly led to more higher-order process questions. There is also evidence that some of the practices advocated by the literacy strategy may have led to an increase in teacher talk and greater demands on pupil listening. It appears there is still a pressing need to develop pedagogic confidence in framing discourse which permits children to be '*active in creating their own understandings*' (Black *et al*., 2002), and which breaks free of the routinised teacher-child-teacher-child interaction pattern so strongly present in all classes investigated for this research. At the heart of this is the need to recognise that creating cognitive and social space for pupil talk is intrinsically related to the quality of the learning experience: '*finding the right words, giving shape to an idea, articulating what is meant: this is where language is synonymous with learning'* (DfEE, 2001).

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